Protecting Communities from Maritime Incidents Involving Airborne Pollutants

Operational Field Guide

FINAL

RCE Wales,

UK Health Security Agency

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Contents

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1. INTRODUCTION

The aim of this guide is to aid decision making in the immediate aftermath of an incident, prior to receipt of detailed monitoring and modelling data.

The manual is aimed at those involved in managing initial response as well as those with emergency planning roles.

What **this guide is not** is a definitive assessment of site and hazard specific risks posed by a particular incident. This will need to be established as information from the scene, local conditions, and ongoing assessment data are collected.

Furthermore, this guide is targeted at protection of protecting the public and not aimed at response personnel located within the immediate source of the incident. Other guidance such as that prepared by response organisations, or The Emergency Response Guidebook[1] should be used by first responders for assessment of these areas.

The guide provides an approach for undertaking an assessment and is primarily designed to be used during training of responders. It can also be used as an aid during response to an incident, during the initial stages prior to receipt of detailed monitoring and modelling. A separate detailed guidance document details the development of the approach and should be read before using this manual.

[1] Emergency Response Guidebook (ERG) | PHMSA (dot.gov)

2. KEY ACTIONS

In the absence of detailed assessments, it will be necessary to provide a best estimate of risks to inform possible protective action options.

To complete this it is important to collect some basic data about the incident, (Checklist Section 4, links Section 5);

- Chemical(s) involved, their hazards and behaviour, and quantity released.
- Estimated duration of the release.
- Prevailing Weather conditions – wind speed and direction, rainfall.
- Distance to receptors, building types, environment (rural or urban) and topography.

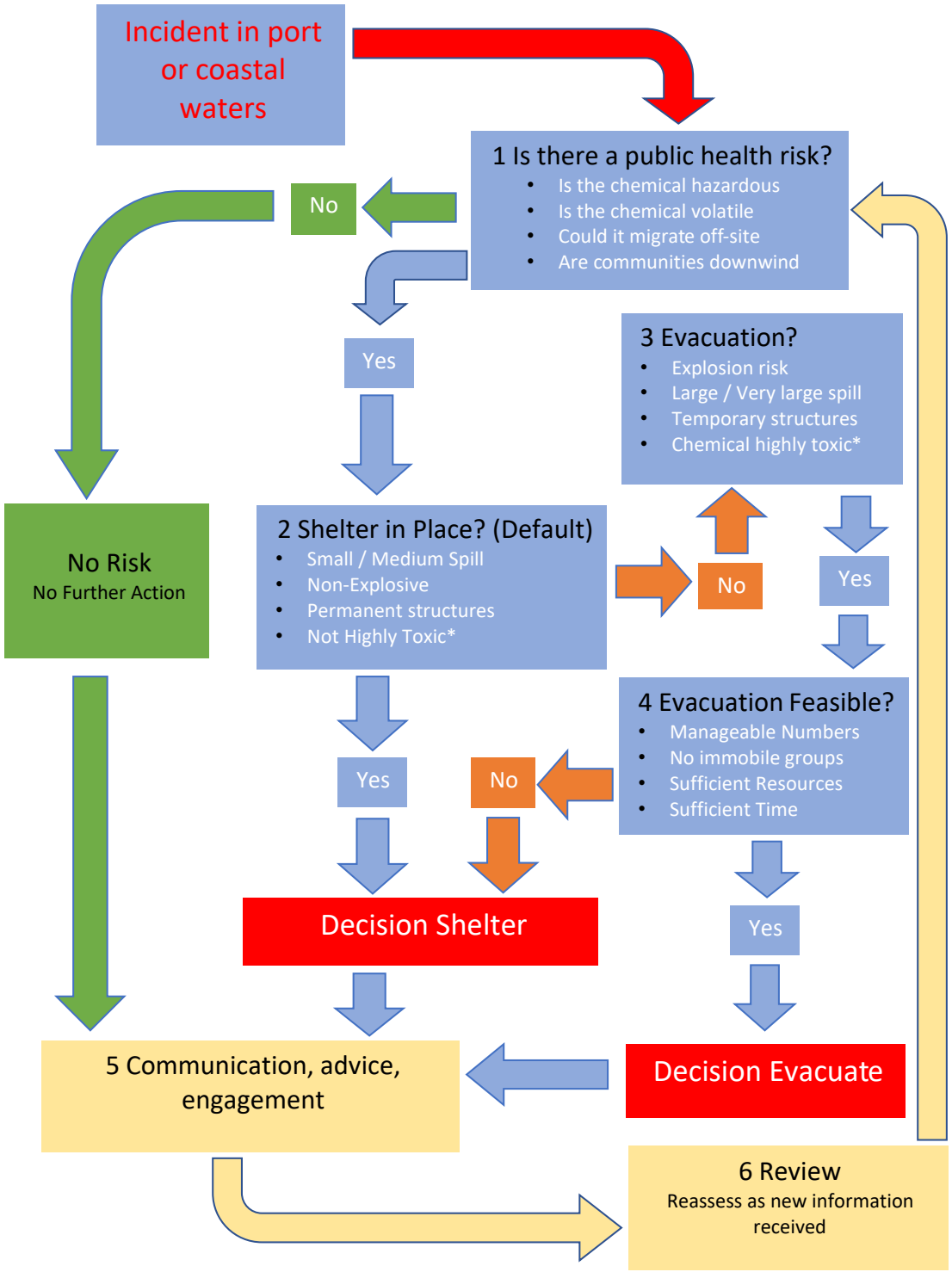
Using this information, a series of initial actions should be considered including

- Evacuation of the immediate area (hot zone) using responder protocols and / or guidance such as the Emergency Response Guidebook for zoning distances.
- Apply initial incident information to inform choice of immediate wider protective actions (Section 3), noting limitations of each option.
- Issue prompt clear advice via media and social media and, by means of physical attendance, if necessary and safe to do so.[2]
- Review advice as more detailed monitoring and modelling data are received
- Update messages as the incident develops
- Where sheltering advice has been provided, inform the public to reventilate properties as soon as the risk has passed.

Mitigation measures to terminate the release and / or reduce its movement for should also be initiated as soon as possible using recognised techniques.

[2] Further details on communications are presented in the main guidance document. Also liaise with comms teams within the response group / agency

3. RESPONSE ALGORITHM[3]



* Highly Toxic - PAC2 less than 2 ppm (Appendix 2) / Seek specialist chemical advice

[3] Factors listed in each box are considerations to aid decision process and should be reviewed in context of site conditions. Final decisions will require an element of judgement by the responder. See also pages 8 and 9

Algorithm Guidelines

If there is a potential risk to a wider community? (<1.5 km downwind[4])

Default advice should be **Shelter in Place –** Stay indoors preferably in a room away from the wind and on an upper floor. Close all doors and windows and turn off air conditioning / ventilation systems. If instructed place damp towels cloths around doors and windows. Monitor media / social media for updates.

Challenges to default advice

Is there a risk of explosion affecting the community?

Is the release likely to be prolonged i.e., more than 2 hours? (large / very large ongoing release of gas, or large / very large spill of evaporating substance. In contrast, an instantaneous large / very large release of gas or vapour may result in a rapidly formed major cloud moving off site and may make evacuation unsafe)

Are there communities in temporary structures (tents, caravans, cabins)?

Is the chemical considered highly toxic (Seek expert chemical advice - Appendix 1)?

If yes to any of the above

Consider Evacuation where feasible i.e., can be achieved before outdoor concentrations become hazardous (2 hours[5]), have sufficient resources / infrastructure to manage evacuation, provide rest centres and if necessary, offer decontamination facilities.

Further Considerations

If not feasible where susceptible / immobile populations are present and cannot be evacuated easily or where this may pose unacceptable risk to health from acute exposure, revert to default shelter advice for this group.

Communicate Advice promptly – using all available channels

Review

Review decisions upon receipt of any new information from scene, or from monitoring / modelling. Update Messages after each review. Where and when appropriate inform communities to ventilate buildings

Provide ongoing advice regards longer term concerns (residual deposition on surfaces, crops / foodstuff, sorbed chemicals on fabrics / furnishings**) and on support available (**medical, well-being, economic, social**)**

[4] 1.5 km is indicative and should be reviewed as site information develops or in line with local emergency plans
[5] 2 hours is indicative and can be reviewed in line with local emergency plans

Additional assessment aids

- Sheltering can be an effective mechanism for reducing exposure to peak concentrations over a limited time, but it may be less effective at reducing cumulative exposure over a longer time period as concentrations build up indoors.
- Studies have estimated the limit at which sheltering indoors might cease being effective, ranges from 30 minutes to a few hours, although sheltering for longer can be viable if outdoor exposures remain low and/or intermittent.
- Short duration releases are likely to result in higher outdoor concentrations downwind favouring shelter.
- Ongoing longer duration release are likely to increase indoor concentrations favouring evacuation.
- Evacuation is often most appropriate for smaller discrete populations and also for non-residential settings such as commercial buildings, workplaces, educational facilities.

4. INFORMATION COLLECTION CHECKLIST

Category	Enter Incident Information Here		Decision Prompts
Chemical(s) Name CAS No UN No			Confirmed/ Suspected Multiple (use additional sheets) Hazardous Y/N
Hazards	Toxic Flammable / Explosive Both		PAC / IDLH **Immediate explosion risk? If yes consider evacuation**
Size[6]	Small / medium – Drum(s) / cylinder(s) / IBC(s) Large – road tanker / ISO V Large – Ship / shore tank		Use to estimate duration as below
Likely Duration	Small <1 hour Large >1 - >2 hours V large > 2 hours		Prolonged >2 hours? If L/VL release consider evacuation
Buoyancy	Heavier than Air Lighter than Air Fire (lighter than air)		Dense gases may be less mobile (see points below) favouring shelter
Location	Port (urban) / Coastal (rural)		Check feasibility for evacuation <1.5 km priority concern
	Nearest downwind community (m)		
	Vulnerable communities?		May limit evacuation
	Temporary structures?		May limit shelter
Topography	Cliffs / Slopes Flat		Steep slopes may impede migration of dense gases
Wind Speed	Light <10 km/h Moderate 10 – 20 km/h Strong >20 km/h		May affect migration Check possible changes in wind direction
Rainfall	Yes / No		Wash out to ground
Time of Day	Day / Night		May affect comms options

[6] Sizes quoted in table are indicative to give initial estimate. Actual spill size may also depend upon the nature of the damage to the vessel(s) involved.

5. USEFUL LINKS

The following table provides links to suggested sources for information on incident parameters

Subject	Source
Chemical Hazards	HNS-MS CAMEO Chemicals | NOAA
Standards (PACs / IDLH)	https://www.epa.gov/aegl/access-acute-exposure-guideline-levels-aegls-values#chemicals https://edms.energy.gov/pac/Search Immediately Dangerous to Life or Health | NIOSH | CDC
Isolation Zones	Emergency Response Guidebook (ERG) | PHMSA (dot.gov)
Modelling	Chemical Meteorology (CHEMET) service - Met Office ALOHA Software | US EPA MANIFESTS - Home (manifests-project.eu)
Incident Management (Maritime HNS)	www.westmopoco.rempec.org
Incident Management (Maritime Gas)	Gaseous releases from maritime incidents — REMPEC Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)
Incident Management (Public Health)	WHO manual for the public health management of chemical incidents
Communication	Arcopol / Training & Awareness EU Hazrunoff Project

APPENDIX 1: REPRESENTATIVE PROTECTIVE ACTION CRITERIA

Chemical Name	PAC Level	1 hour mg/m³	8 hour mg/m³	Odour mg/m³	Conversion from mg/m³ to ppm
Ammonia	PAC-1	21.0	21.0	4.0	X 1.4
	PAC-2	77.0	77.0		
Chlorine	PAC-1	1.5	1.5	1.5	X 0.35
	PAC-2	5.8	2.0		
Hydrogen Sulphide	PAC-1	0.70	0.46	0.014	X 0.7
	PAC-2	39.0	24.0		
Hydrogen chloride	PAC-1	2.7	2.7	0.1 to 1.4	X 0.7
	PAC-2	33.0	17.0		
Hydrogen Fluoride	PAC-1	0.8	0.8	0.017	X 1.2
	PAC-2	20.0	10.0		
Benzene (BTEX)	PAC-1	170.0	29.0	4.9	X 0.3
Methane (LNG) Flammability	PAC-1	43000.0	-	NA	X 1.5
	PAC-2	150000.0	-		
Butane (LPG)	PAC-1	13000.0	13000.0	3.0	X 0.4
	PAC-2	40000.0	40000.0		
Ethylene Oxide	PAC-1	NA	NA	470.0	X 0.5
	PAC-2	81.0	14.0		
Kerosene (Jet Fuel JP5 and 8)	PAC-1	290.0	290.0	0.6	X 0.12
	PAC-2	1100.0	1100.0		
Gasoline (as Octane)	PAC-1	2900.0	-	2900.0	X 0.2
	PAC-2	12000.0	-		
Formaldehyde	PAC-1	1.1	1.1	4.5	X 0.8
	PAC-2	17.0	17.0		
Nitrogen Dioxide	PAC-1	0.9	0.9	0.8	X 0.5
	PAC-2	23.0	13.0		
Carbon monoxide	PAC-1	NA		NA	X 0.9
	PAC-2	95.0	31.0	NA	
Sulphur Dioxide	PAC-1	0.5	0.5	1.8	X 0.4
	PAC-2	2.0	2.0		

PAC 1 is concentration above which transient effects may occur. PAC 2 represents a concentration above which more permanent effects may occur. PACs are also defined for various exposure durations. Chemical Safety Program: PACs for Chemicals of Concern - Index (energy.gov)